

WHAT IS CLAIMED IS:

1. A transmitting apparatus in a ring network in which a plurality of transmitting apparatuses are connected in ring form so as to be capable of transmitting in each of upstream and downstream directions, working and protection channels are assigned to each direction and, when failure occurs in a transmission path, a transmit signal is looped back using the protection channel to effect rescue, said apparatus comprising:
 - 10 rescue-impossible detection means for detecting that communication between an insert transmitting apparatus that incorporates a packet, which enters from a lower-order side, into a higher-order signal and transmits the signal to a transmission path, and a drop
 - 15 transmitting apparatus that extracts the packet from the higher-order signal and transmits the packet to another lower-order side, has become unrescuable owing to transmission-path failure; and
 - packet-transmission halting means for halting
 - 20 transmission of the packet to the transmission path when communication has become unrescuable.
2. The apparatus according to claim 1, further comprising failure-occurrence detection means for detecting that multiple failures have occurred at
- 25 multiple locations in a transmission path and obtaining a signal non-arrival range within which a signal does not arrive owing to the multiple failures at the multiple locations;

said rescue-impossible detection means of the insert transmitting apparatus determining that rescue is impossible when the drop transmitting apparatus resides in the signal non-arrival range.

- 5 3. The apparatus according to claim 1, further comprising failure reporting means, wherein when an upstream connection and a downstream connection are set as a pair and the upstream connection becomes unrescuable, said failure reporting means sends a
- 10 failure notification packet to a packet transmitting source on the lower-order side via the downstream connection of the pair.
4. The apparatus according to claim 2, wherein a first transmitting apparatus that has detected failure in a
- 15 transmission path in one direction of upstream and downstream directions transmits, in the one direction, a first packet (long packet), which reports occurrence of the failure, to a second transmitting apparatus between which and the first transmitting apparatus a failure
- 20 point is sandwiched, and transmits, in the other direction, a second packet (short packet), which reports occurrence of the failure, to the second transmitting apparatus; the second transmitting apparatus, which has received the first packet, transmits, in said other
- 25 direction, a third packet (long packet), which reports occurrence of the failure, to the first transmitting apparatus; and said failure-occurrence detection means of the insert transmitting apparatus detects occurrence

of multiple failures based upon destination of each long packet that has been transmitted from another transmitting apparatus.

5. The apparatus according to claim 2, further comprising a table for retaining apparatus IDs of packet-drop transmitting apparatus in association with packet connection IDs;

10 said rescue-impossible detection means of the insert transmitting apparatus obtaining, from said table in response to occurrence of multiple failures, a drop transmitting apparatus of a packet that enters from the lower-order side, and deciding that rescue has become impossible when said drop transmitting apparatus resides in the signal non-arrival range.

- 15 6. The apparatus according to claim 1, wherein when communication has become unrescuable owing to transmission-path failure in a point-to-multipoint drop connection that transmits the same packet from one insert transmitting apparatus to a plurality of drop transmitting apparatuses, a packet-transmission halting means of said insert transmitting apparatus halts transmission of the packet to the transmission path.
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7. The apparatus according to claim 5, wherein the apparatus ID of a drop transmitting apparatus farthest from the insert transmitting apparatus in the direction of packet transmission is retained in said table in a point-to-multipoint drop connection that transmits the same packet from one insert transmitting apparatus to a
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plurality of drop transmitting apparatuses; and

said rescue-impossible detection means of the insert transmitting apparatus obtains, from said table in response to occurrence of multiple failures, a farthest-end drop transmitting apparatus of a packet, and decides that rescue has become impossible when said drop transmitting apparatus resides in the signal non-arrival range.

8. The apparatus according to claim 6, wherein in a case where the same connection ID is not used in different spans of a network in a point-to-multipoint drop connection that transmits the same packet from one insert transmitting apparatus to a plurality of drop transmitting apparatuses, said rescue-impossible detection means of the insert transmitting apparatus decides that rescue has become impossible when a drop transmitting apparatus nearest to said insert transmitting apparatus resides in the signal non-arrival range.
9. The apparatus according to claim 5, wherein in a case where the same connection ID is not used in different spans of a network in a point-to-multipoint drop connection that transmits the same packet from one insert transmitting apparatus to a plurality of drop transmitting apparatuses, the apparatus ID of a drop transmitting apparatus nearest to the insert transmitting apparatus in the direction of packet transmission is retained in said table; and

said rescue-impossible detection means of the insert transmitting apparatus obtains, from said table in response to occurrence of multiple failures, a nearest-end drop transmitting apparatus of a packet, and
5 decides that rescue has become impossible when said drop transmitting apparatus resides in the signal non-arrival range.

10. The apparatus according to claim 1, wherein when communication has become impossible owing to multiple
10 transmission-path failures in a multipoint-to-point insert connection that transmits packets from a plurality of insert transmitting apparatuses to one drop transmitting apparatus using the same connection ID, a packet-transmission halting means of each insert
15 transmitting apparatus halts transmission of the packet to the transmission path.

11. The apparatus according to claim 1, wherein in a case where the same connection ID is not used in different spans of a network in a multipoint-to-point
20 insert connection that transmits packets from a plurality of insert transmitting apparatuses to one drop transmitting apparatus using the same connection ID, said rescue-impossible detection means of each insert transmitting apparatus decides that rescue has become
25 impossible when the drop transmitting apparatus resides in the signal non-arrival range.

12. The apparatus according to claim 5, wherein in a case where the same connection ID is not used in

- different spans of a network in a multipoint-to-point insert connection that transmits packets from a plurality of insert transmitting apparatuses to one drop transmitting apparatus using the same connection ID, the
- 5 ID of the drop transmitting apparatus is retained in said table of each insert transmitting apparatus; and
- when failures occur at multiple locations, said rescue-impossible detection of each insert transmitting apparatus obtains a multipoint-to-point drop
- 10 transmitting apparatus and decides that rescue has become impossible when this drop transmitting apparatus resides in the signal non-arrival range.
13. The apparatus according to claim 6, further comprising failure reporting means, wherein a
- 15 multipoint-to-point insert connection and a point-to-multipoint drop connection are managed as a pair and, when a prescribed insert connection becomes unrescuable, said failure reporting means inserts a failure notification packet in the drop connection of the pair.